Aesthetic composite layering of implant-supported restorations in an edentulous jaw

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A good option for the lifelike recreation of gingival tissue

Careful planning is indispensable in the treatment of an edentulous jaw with implant-supported restorations. The axes and positions of the implants must correspond to the given biological, mechanical, and aesthetic conditions. In situations in which severe bone recession has occurred, the work of the dental team has to involve the reconstruction of the dental and the gingival tissue. The flawless reconstruction of gingival tissue requires sound teamwork, as well as excellent materials and exceptional skill. Layering with the light-curing laboratory composite SR Nexco (Ivoclar Vivadent) takes this procedure to a new level.

Surgical phase

Owing to the sufficient bone structure in the lower jaw, this part of the mouth could be restored at once with four immediately loadable implants. During the reconstructive phase, the upper jaw had to be treated with a provisional removable denture owing to the atrophied alveolar ridge. The tooth extractions from the upper and lower jaw were performed on one day. At the same time, four mandibular implants were placed and loaded. An immediate denture was seated in the upper jaw.

The determination of the occlusal plane and the ideal incisal line allows the dental arches to be integrated more easily in terms of aesthetics and function. Open-tray impressions were taken with a special plaster (Snow White, Kerr Dental) and unsplintered impression posts. The considerable stiffness of the impression material completely immobilised the impression posts, thereby preventing any errors in the casting of the study models.

An articulator allows the kinematics of the jaw to be correctly simulated. The goal of this part of loaded provisional restorations. For this purpose, however, the model has to be mounted in the articulator. In the present case, the mandibular model was positioned in correct relation to the hinge axis-occlusal plane. Subsequently, we adjusted the bite patterns in order to record the vertical dimension of occlusion.

The centric relation is regarded as the reference position for adjusting the muscles to the centric and functional jaw relation. The mandibular model was mounted in the articulator with the help of an antagonistic jaw relation record. If the centric relation was marked on the plaster base of the model (vertical and horizontal). The vertical axis represents the midfacial plane. From the front, the horizontal axis is aligned parallel to the interdental plane and line from the side to Camper’s plane. These markings, which should be very close to the working tangent function, was a guide for the technician in setting up the incisal line. Therefore, the incisal line is aligned parallel with the midfacial plane. The Camper’s plane markings indicate the alignment of the occlusal plane. All these elements provide a sound rationale for the tooth set-up according to aesthetic and functional principles.

We selected the tooth shade and the teeth on the basis of the SR Phonares II tooth mould chart (Ivoclar Vivadent). Holding the teeth up against the lips of the patient quickly reveals whether they were in harmony with her facial features. The set-up of the teeth according to the Ditramax markings (Fig. 6) allows the situation to be clinically validated. In this case, attention was given in particular to the aesthetic integration of the dentogingival complex when the patient was smiling. The lip dynamics were shown with video clips. The functional criteria were also checked. The vertical dimensions of occlusion had to be harmonious in order to achieve a balanced lower facial third and proper phonation.

We felt that a CAD/CAM-fabricated titanium framework (NobelProcera, Nobel Biocare) would best fulfil this indication. The double-scan technique allowed the implant model to be superimposed on the tooth set-up to construct the framework. In the next step, the framework was machined and then tried on the model and in the patient’s mouth (Fig. 7). The cast impression and the high-performance processing systems significantly contributed to providing the optimal passive (tension-free) fit of the framework, which is decisive for the long-term success of the restoration.

The areas that needed to be built up with gingival materials were blasted with aluminium oxide at 200 to 300 kPa air pressure. Subsequently, the SR Link bonding agent (Ivoclar Vivadent) was applied, followed by a thin layer of the light-curing SR Nexco Gingiva Opaquer to mask the metal framework. The Opaquer was polymerised and then a second coating was applied and polymerised. The resulting inhibition layer was removed.
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The conventional flask technique with a heat-curing denture base material (ProBase Hot, Ivoclar Vivadent) was used to produce the denture. After the polymerisation process, the denture base was ground and space was made for building up the Gingiva composite. The surface was conditioned by blasting it with aluminium oxide (50 µm) at 200 kPa (Fig. 8). A bonding agent was then applied and left to react for three minutes before it was light cured.

In order to achieve very lifelike results in the layering of the gingival tissue, saturated (intensive) materials (SR Nexco Paste Intensive Gingiva) were used first (Fig. 9). Next, translucent, light-curing gingival materials (SR Nexco Paste Gingiva and SR Nexco Paste Basic Gingiva) were used to impart the gingival areas with the desired depth (Fig. 10). The colours of the Gingiva composites range from pale pink through reddish and orange to purple. A certain amount of time and effort are necessary to master the necessary mixing techniques and achieve a harmonious interplay of the intensive and the translucent materials. Practical experience is essential. With some technical skill, the gingival areas can be naturally reproduced in terms of shape, texture and shade.

All the individual layers were precured (Quick curing light, Ivoclar Vivadent) in segments. A high-performance curing light was used for the final polymerisation. Prior to this step, a coating of glycerine gel (SR Gel, Ivoclar Vivadent) was applied to the surfaces to prevent oxygen inhibition, which could lead to an unattractive result that is difficult to polish. The surfaces of the teeth were characterised with a vertical and horizontal macrostructure. Particular attention was paid to mechanical polishing. Once the glycerine gel had been removed, the restorations were finished with different polishing instruments (various grit sizes, pumice, leather buffing wheels and universal polishing paste; Fig. 11). In the present case, mechanical polishing was preferred to glazing with a light-curing composite in order to prevent premature ageing of the surface.

The dentures were seated manually with the help of multi-unit abutments from Nobel Biocare (Fig. 12). The screw channels were sealed with Teflon and light-curing composite resin. The position of maximum intercuspation was checked and the occlusal pathways were adjusted to the protrusive and laterotrusive movements. In addition, the restorations were checked in terms of the ability to clean them with interdental brushes, and the patient was given special instructions regarding her oral hygiene.

Conclusion

For a long time, ceramics were considered to be the aesthetic benchmark. With the introduction of state-of-the-art industrially fabricated acrylic teeth specially designed for implant applications, the bar for aesthetics has been raised in this category of materials. The teeth used in this case exhibit a true-to-nature morphology, which allows the restoration to be functionally integrated without any problems. Using the laboratory composite SR Nexco to recreate gingival tissue is an effective restorative approach. In contrast to ceramic materials, the composite resin is easy to handle and delivers exceptionally aesthetic results (Fig. 13). The light weight of the material is an added benefit. An all-ceramic restoration (zirconium dioxide framework, layering ceramic, gingival mask) weighs almost twice as much as a titanium and composite resin denture. Another advantage of the type of restoration described here is its long service life.

The success of an implant-supported denture depends on the systematic coordination of all the surgical and prosthetic requirements. A strict procedure needs to be followed from the treatment plan to the final outcome. Layering gingival portions with a laboratory composite represents a genuine improvement on previous materials and methods with regard to aesthetics, handling and hygiene (Fig. 14).